Title (en)

PROCESS FOR THE DIRECT PRODUCTION OF TUNGSTEN CARBIDE POWDERS OF VARIOUS GRAIN SIZES STARTING FROM SCHEELITE

Title (de)

VERFAHREN ZUR DIREKTSYNTHESE VON WOLFRAMCARBIDPULVERN MIT VERSCHIEDENEN TEILCHENGRÖSSEN AUS SCHEELIT

Title (fr)

PROCÉDÉ DE SYNTHÈSE DIRECTE DE POUDRES DE CARBURE DE TUNGSTÈNE DE TAILLES DE PARTICLES VARIÉES À PARTIR DE SCHEELITE

Publication

EP 3098199 A1 20161130 (EN)

Application

EP 16171603 A 20160526

Priority

IT UB20151362 A 20150526

Abstract (en)

The invention relates to a process which allows to obtain powders of tungsten carbide directly from tungsten ores belonging to the class of scheelite by carbothermic reduction carried out in non-drastic conditions with regard to the times and/or temperatures, and in which the obtained powders may have different particle size as said treatment conditions are varying. The process starts from powders of scheelite (CaWO 4) and carbon in pro-portions such as to have a maximum excess of carbon, compared to the expected conversion reaction, of about 5-6% by weight, mixed with the 0,4-6% by weight of powder of one or more transition metals of the former group VIIIB (now groups 8, 9 and 10), in particular Co, Ni or Fe, as the promoter of the conversion in carbide and/or as activator of the WC grain growth, and comprises a powder grinding step, a heat treatment step of the mixture of powders obtained by milling at temperatures between 900 and 1500°C in an inert atmosphere or under vacuum, and a step of purification of the resulting powder by leaching of residual oxides.

IPC 8 full level

C01B 32/949 (2017.01)

CPC (source: EP)

C01B 32/949 (2017.07)

Citation (applicant)

- US 4008090 A 19770215 - MIYAKE MASAYA, et al
- US 3379503 A 19680423 - MOWRY MCKENNA PHILIP
- US 4834963 A 19890530 - TERRY CHARLES J [US], et al
- US 3743499 A 19730703 - RAMQVIST L
- S. NORGEN ET AL., INT. J. REFRACT. MET. HARD MATER., vol. 48, 2015, pages 31 - 45
- BS TERRY; DC AZUBIKE, TRANS. IMM, vol. 99, 1990, pages C175 - 180
- TERRY BS; DC AZUBIKE; A. CHRYSANTHOU, J. MATER. SCI., vol. 29, 1994, pages 4300 - 4305
- R. F. JOHNSTON; H.T. NGUYEN, MATERIALS ENGINEERING, vol. 9, no. 7, 1996, pages 765 - 773
- NJ WELHAM, MATER. SCI. ENG., vol. A 248, 1998, pages 230 - 237
- NJ WELHAM, AM. INST. CHEM. ENG. J., vol. 46, 2000, pages 68 - 71
- J. TEMUUJIN; M. SENNA; T. JADAMBAA; D. BYAMBASUREN, J. AM. CERAM. SOC., vol. 88, no. 4, 2005, pages 983 - 985
- K.J.D. MACKENZIE; J. TEMUUJIN; C. MCCAM-MON; M. SENNA, J. EUROP. CERAM. SOC., vol. 26, 2006, pages 2581 - 2585
- H. SINGH; OP PANDEY, CERAMICS INTERNATIONAL, vol. 39, 2013, pages 785 - 790
- H. SINGH; OP PANDEY, CERAMICS INTERNATIONAL, vol. 39, 2013, pages 6703 - 6706
- POLINI R. ET AL., INT. J. REFRACT. MET. HARD MATER., vol. 51, 2015, pages 289 - 300
- S. TAKATSU, POWDER METALLURGY INTERNATIONAL, vol. 10, no. 1, 1978, pages 13 - 15
- CF DAVIDSON; GB ALEXANDER; ME WADSWORTH: "Catalytic effect of cobalt on the carburization kinetics of tungsten", METALLURGICAL TRANSACTIONS A, vol. 10, no. 8, August 1979 (1979-08-01), pages 1059 - 1069
- R. POLINI; E. PALMIERI; G. MARCHESELLI: "Nanostructured tungsten carbide synthesis by carbothermic reduction of scheelite: A comprehensive study", INT. J. REFRACT. MET. HARD MATER., vol. 51, 2015, pages 289 - 300

Citation (search report)

- [AD] POLINI R ET AL: "Nanostructured tungsten carbide synthesis by carbothermic reduction of scheelite: A comprehensive study", INTERNATIONAL JOURNAL OF REFRACTORY METALS AND HARD MATERIALS (AVAILABLE ONLINE 01 MAY 2015), vol. 51, 1 May 2015 (2015-05-01), pages 289 - 300, XP002753140, ISSN: 0263-4368
- [A] BUTUKHANOV V L ET AL: "Carbothermic reduction of calcium tungstate in the presence of various oxides", THEORETICAL FOUNDATIONS OF CHEMICAL ENGINEERING (PLEIADES PUBLISHING LTD), vol. 42, no. 5, October 2008 (2008-10-01), pages 699 - 702, XP002753141, DOI: 10.1134/S0040579508050370
- [A] SMITH E N: "Tungsten carbide. Crystals by the ton", INTERNATIONAL JOURNAL OF REFRACTORY METALS AND HARD MATERIALS 1989 DEC, vol. 8, no. 4, December 1989 (1989-12-01), pages 204 - 206, XP008178654

Cited by

CN107867690A; CN112551528A

Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Designated extension state (EPC)

BA ME

DOCDB simple family (publication)

EP 3098199 A1 20161130; **EP 3098199 B1 20171115**; IT UB20151362 A1 20161126

DOCDB simple family (application)

EP 16171603 A 20160526; IT UB20151362 A 20150526